TV White Space

DOE
Spectrum Technology Workshop

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H. Mark Gibson
Director, Business Development

COMSEARCH®
A CommScope Company

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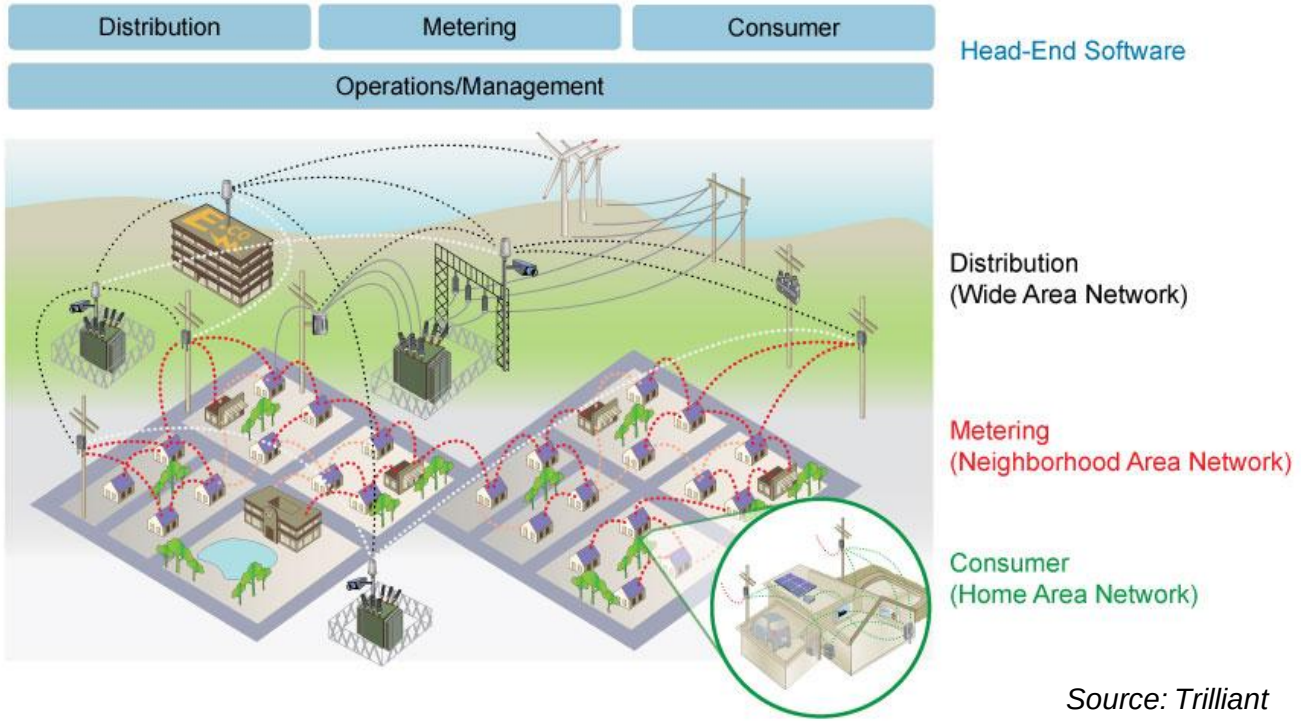
Topics

- Background
- What is “White Space”
- Applications
- Issues
- Wrap-up

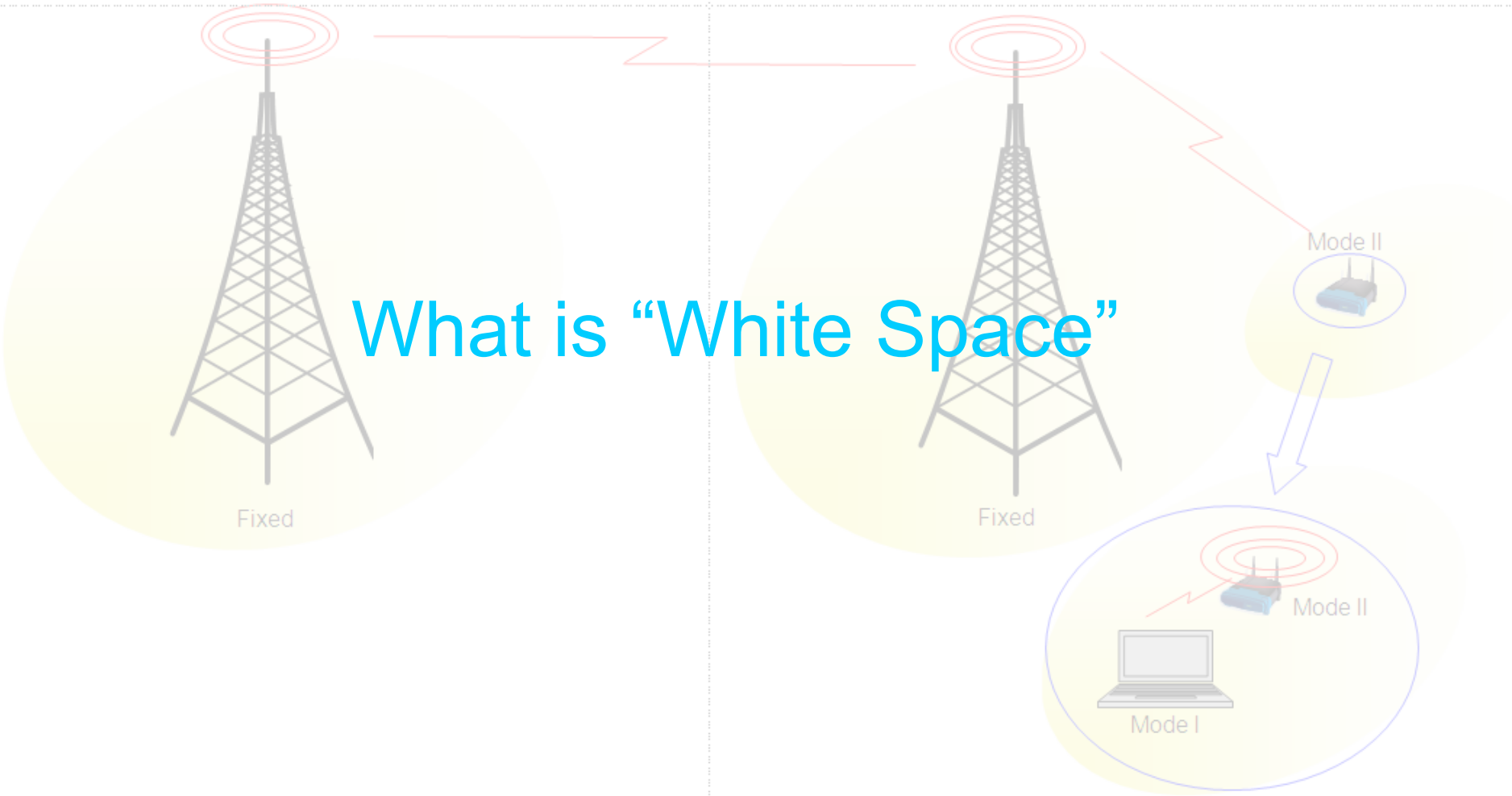
Background

- Smart Meter Deployment (Pike Research)
  - 200M worldwide
  - 40M North America
- Utilities are realizing cost savings from smart meters due to features such as remote disconnect and efficient meter reading



Source: Trilliant

What is “White Space”



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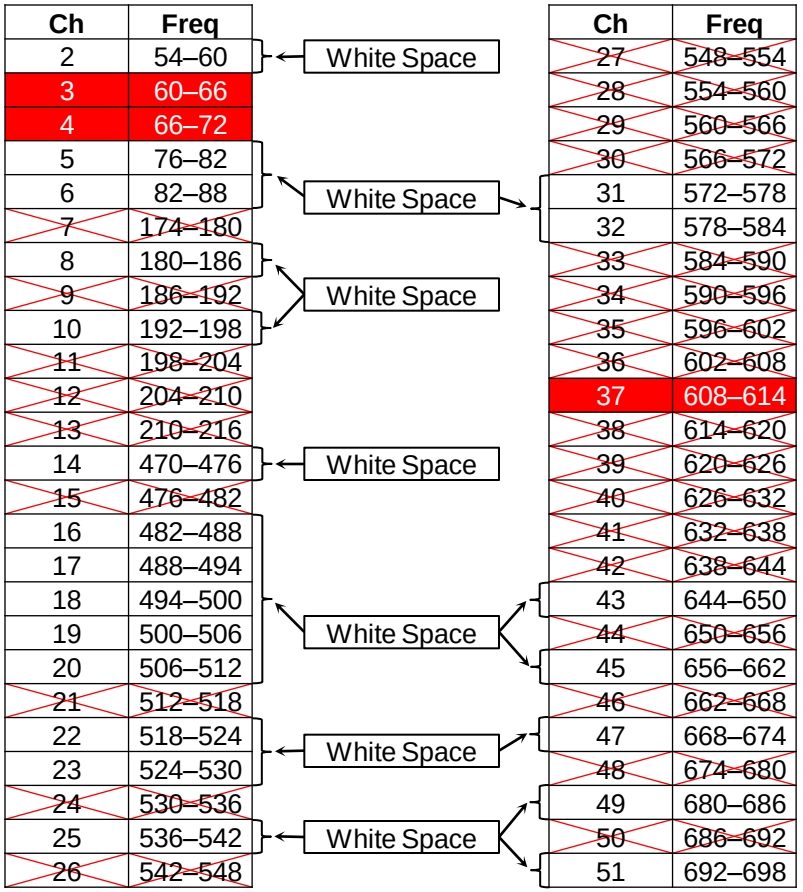
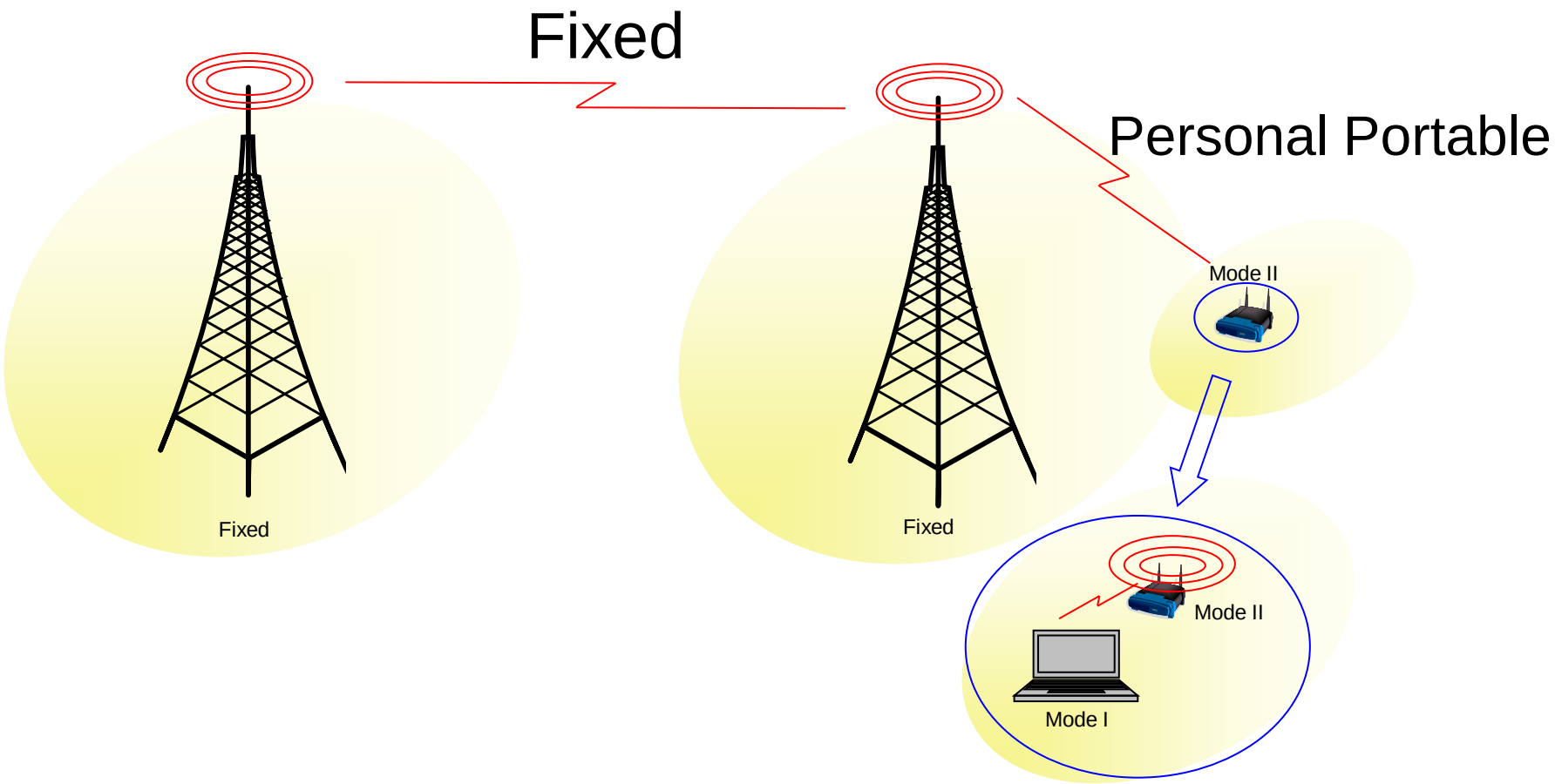
Definition

- FCC says: *"…unlicensed radio transmitters operating in the broadcast television spectrum at locations where that spectrum is not being used by licensed services…"*
- Operating channels determined by a geo-location database (or spectrum sensing)

TV Channels in DC/Baltimore



Two Types of Devices



Fixed Devices

- Permanently installed base station transmitting to one or more fixed devices or to a Personal Portable device
- Max Tx power is 4W EIRP (1W into 6dBi gain antenna, 36 dBm)
- Max antenna height is 30m AGL and 250m HAAT
- Cannot operate co- or adj-channel to existing TV operation
- Must be professionally installed (to get location) OR geolocated
- Geolocation accuracy must be 50m
- Must register in database
- Must use database to provide list of channels available for operation

Fixed Devices

- Must check database at least daily
- Must disable within up to two days if device fails to contact database
- Database will unregister a device if it does not contact the database for three months
- Can receive available channels from another Fixed device
- Device sends available channels to Personal Portable devices associated with it
- Antennas must be outdoor
- Must transmit identifying information

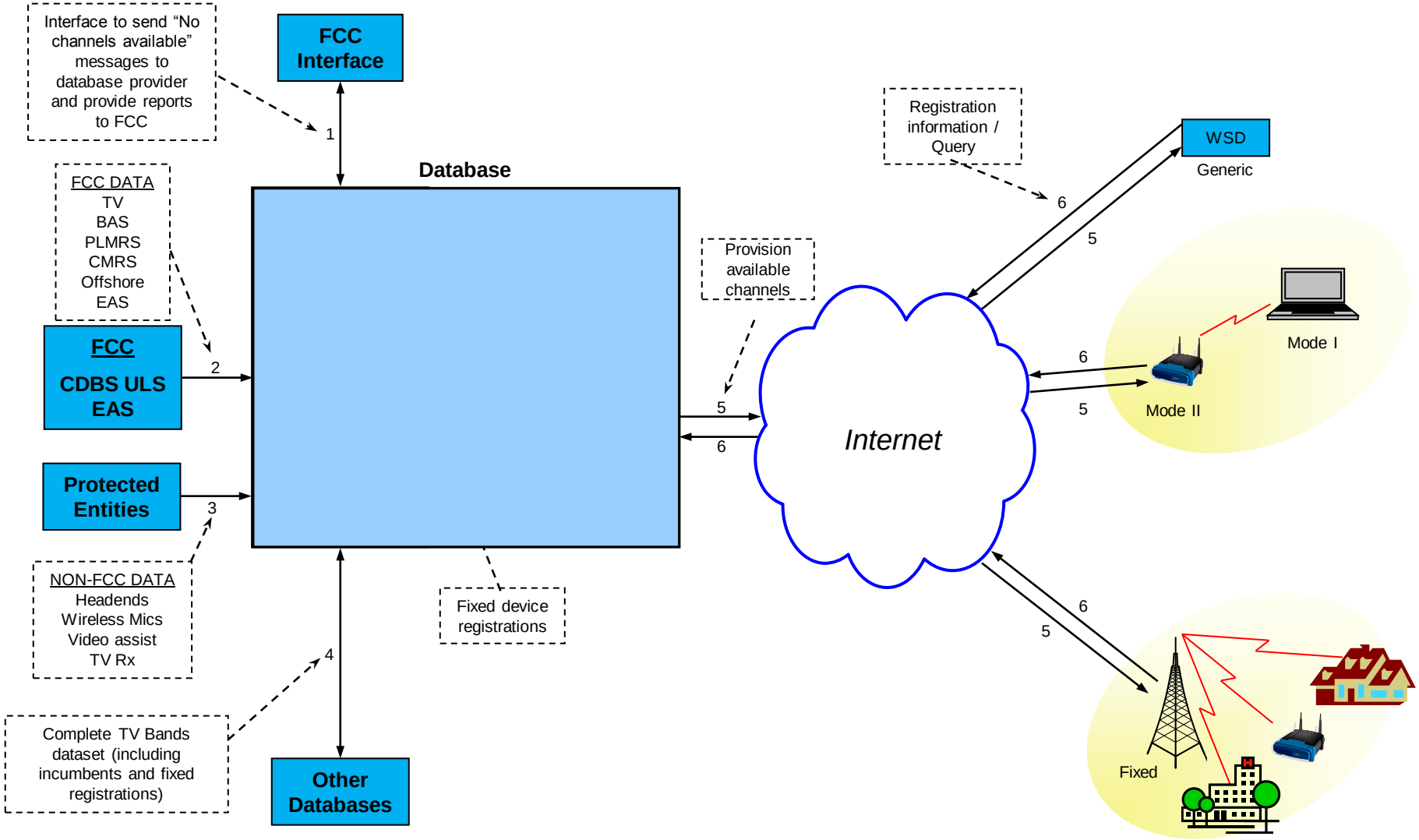
Personal Portable Devices

- Max Tx power is 100 mW EIRP (20 dBm)
- Except 40 mW EIRP (16 dBm) if adjacent to licensed station within protected coverage area
- Don't need to register in database
- Don't need to send basic ID info when operating
- Cannot operate co-channel to existing TV stations
- Cannot operate in TV channels 2 – 20

Personal Portable Devices

- Mode I – client
  - Under control of a Fixed device or a Personal Portable device that employs a geolocation database
  - Receives available channels from Mode I or Fixed
- Mode II – independent
  - Determines available channels on its own using a geolocation database
    - Can get channels from a Fixed Device
  - Must disable if unable to determine location
  - Must access database every 60 sec and every time device moves and at least daily
  - Must disable within a day if device fails to contact database

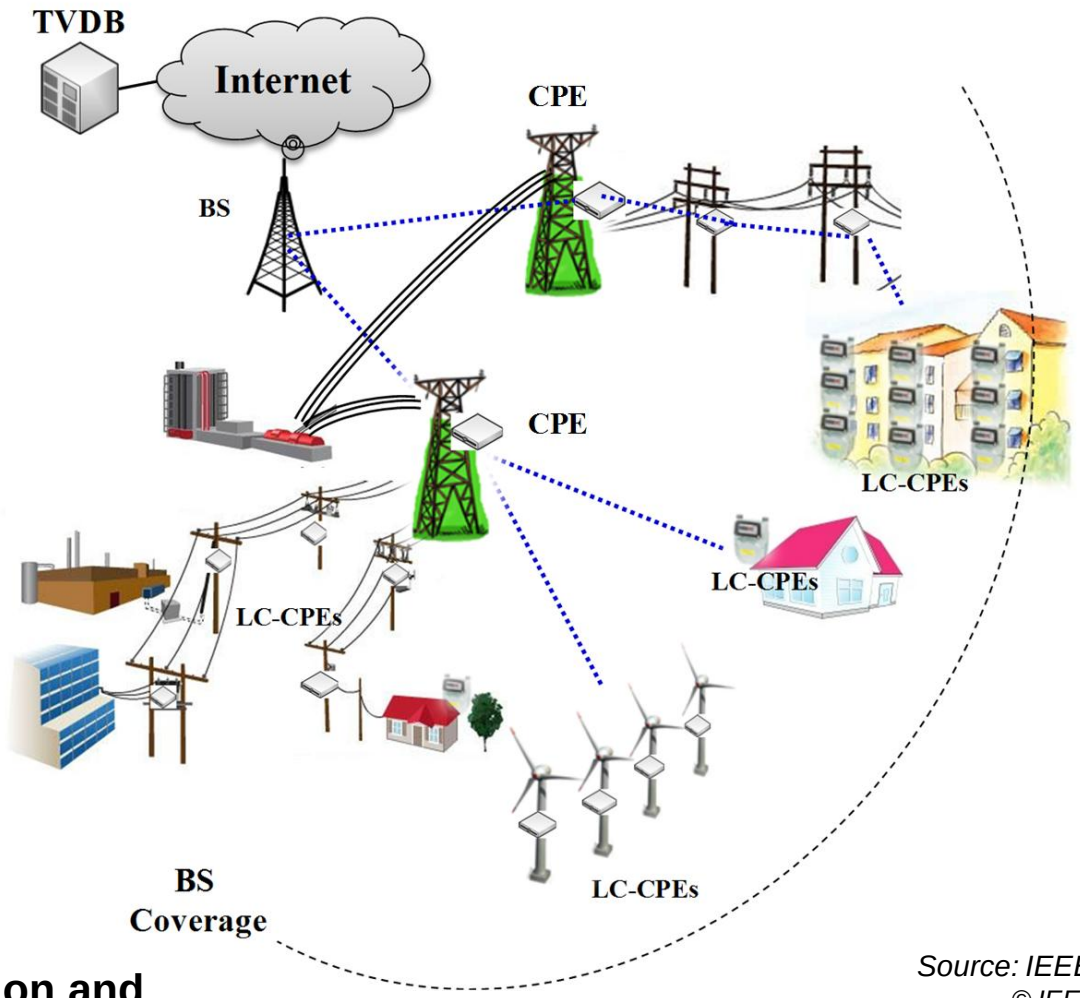
How It Works



Characteristics

- Relatively low frequency means good propagation and building penetration
- Uplink limited
  - Lower power for personal portables
- May be capacity-limited
  - Based upon number of available channels
- Bands are unlicensed
- Some international spectrum harmonization
  - So far, most white space is in VHF/UHF TV bands
- Database concept extensible to other spectrum bands
- Standards-based interfaces

Some Applications



Source: IEEE 802.22
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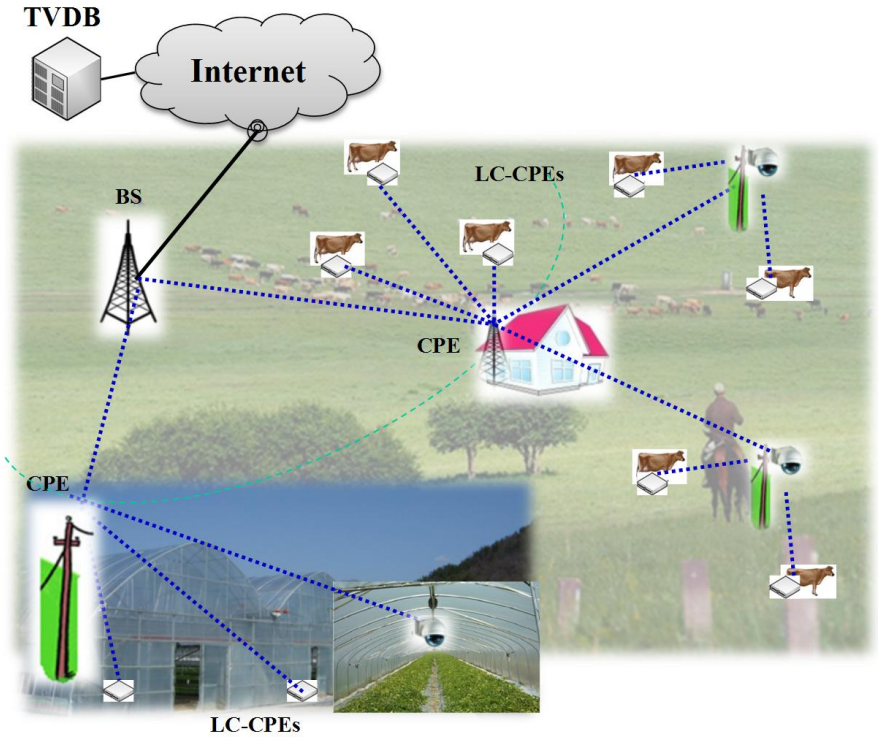
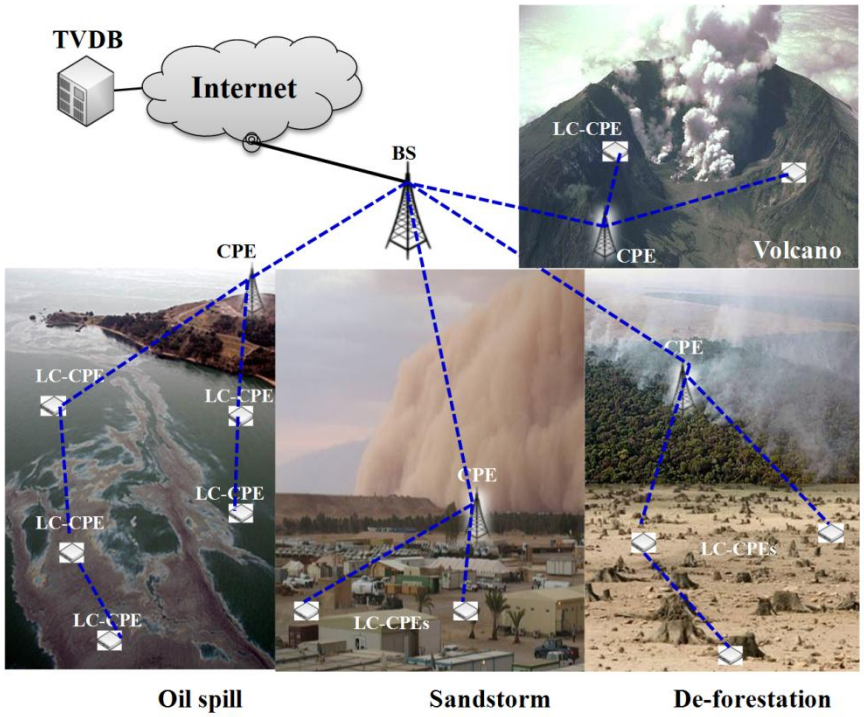
Distribution Automation and Advanced Metering Infrastructure

Some Applications



Farm Monitoring



Environmental Monitoring

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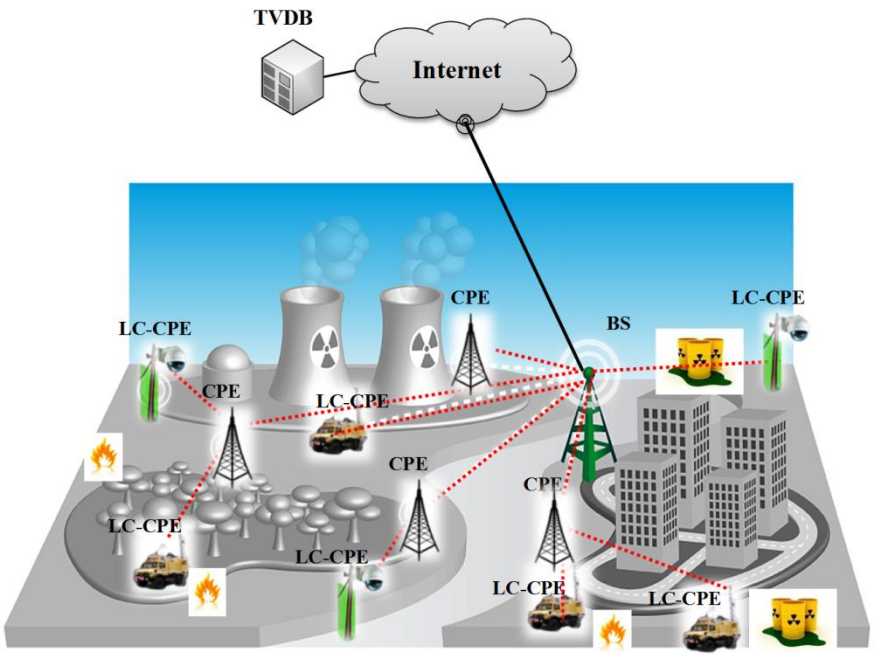
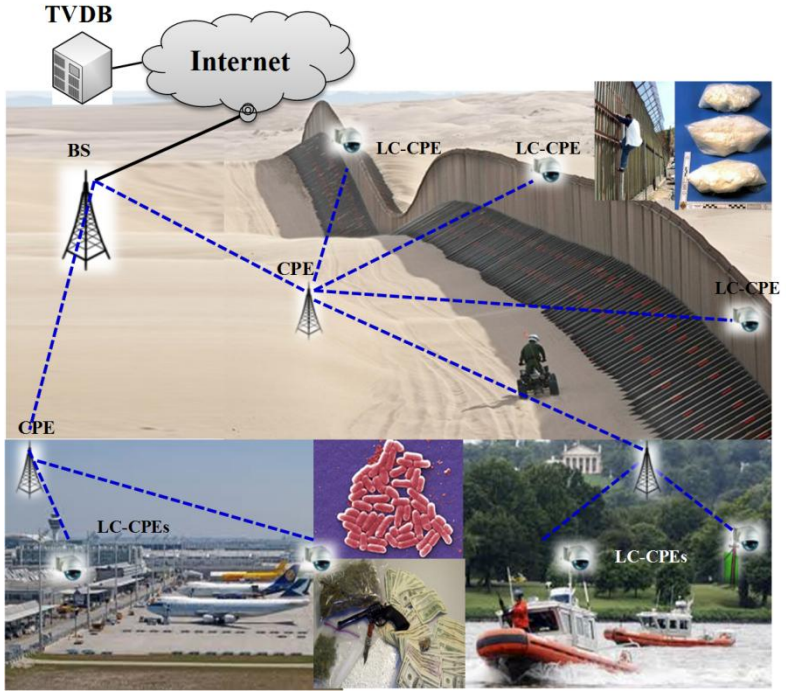
Some Applications



Hazard Monitoring



Homeland Security Monitoring

Source: IEEE 802.22
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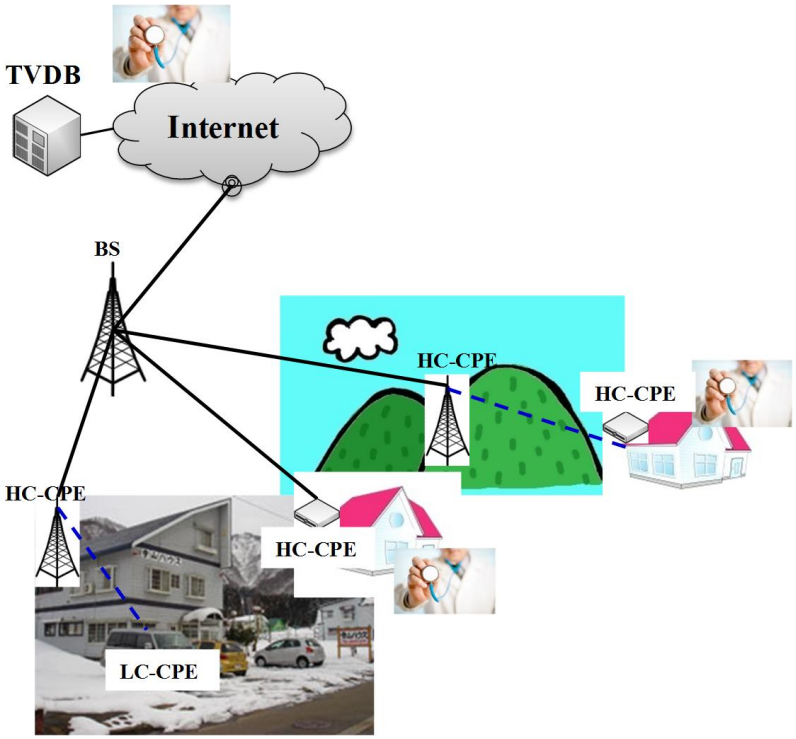
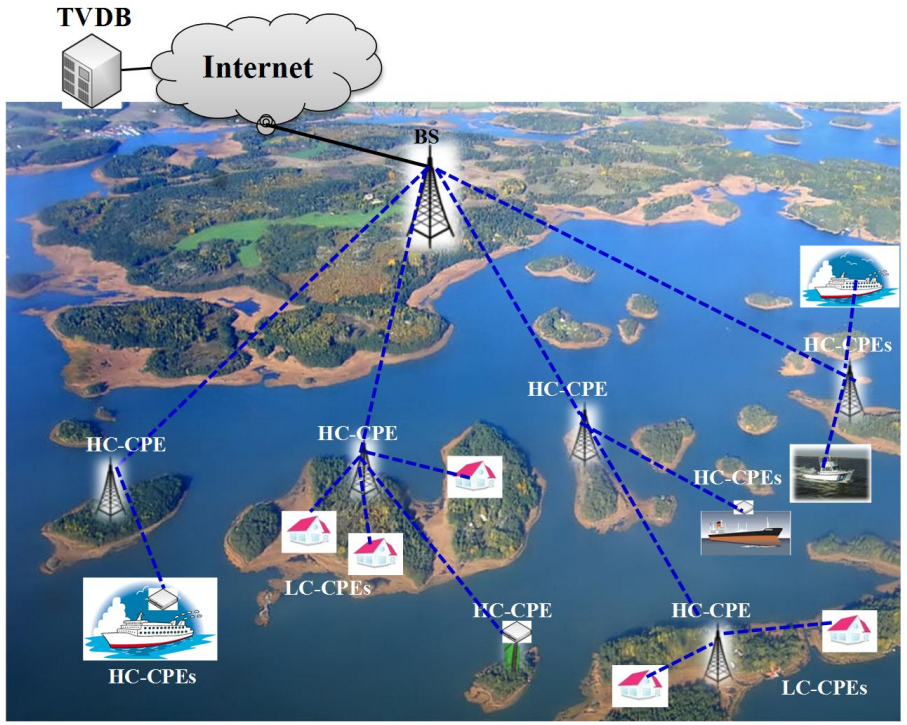
Some Applications



Remote Medical



Archipelago/Marine Broadband

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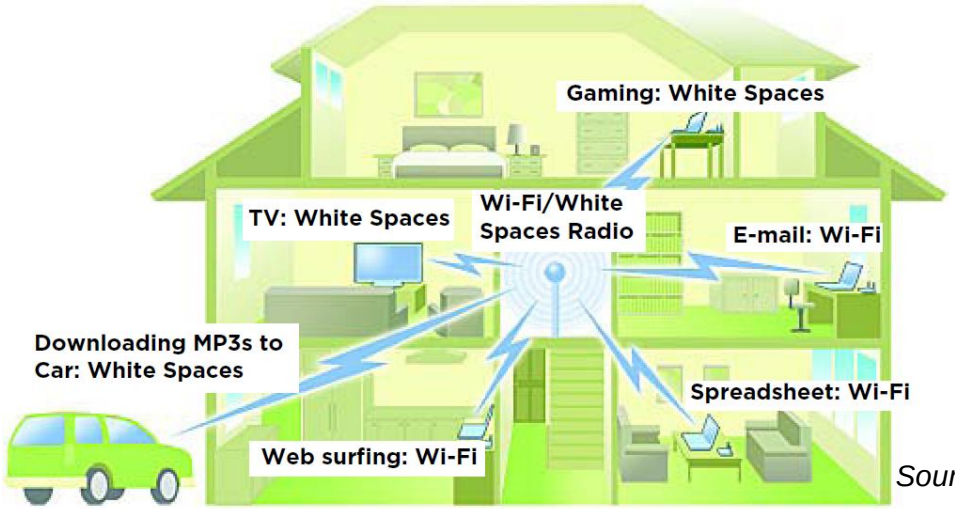
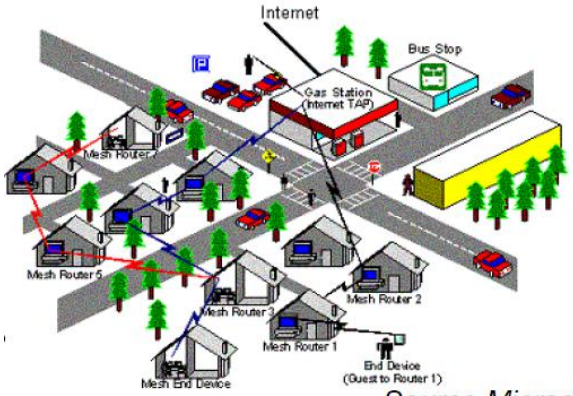
Some Applications

In-home Multi-media Distribution



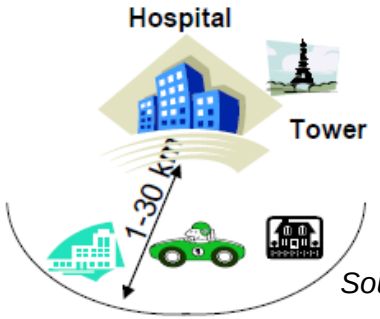
Source: Dell

Neighborhood Networks



Source Microsoft

Tele-Health
(Assisted Living & Elderly Care)



Source: Philips

Fixed and/or Portable

Home Automation & Control

Source: Philips

Low Power Portable

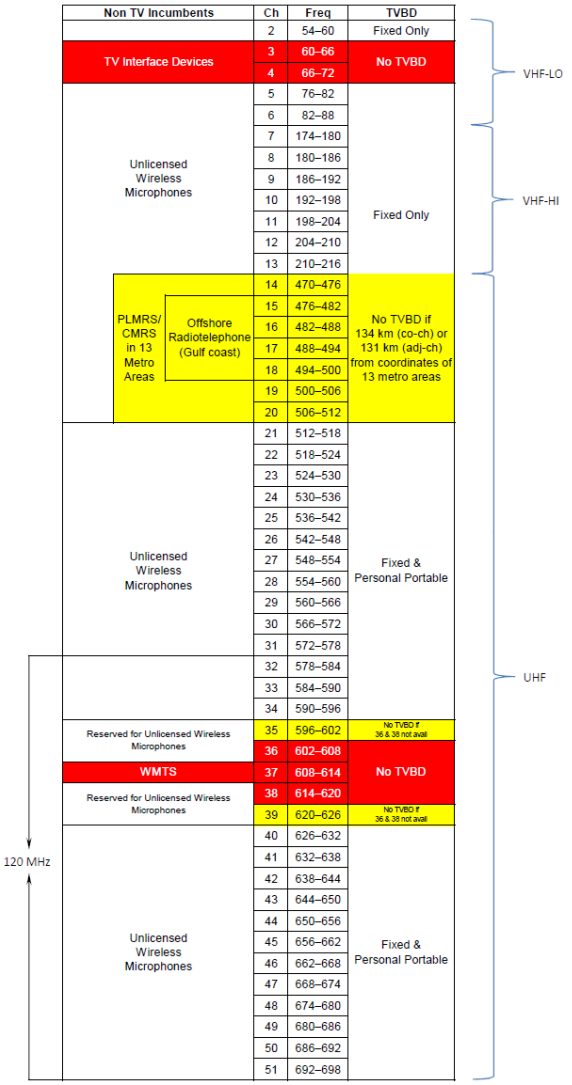
Telephony

Source: Philips

Low Power Portable

Issues

- Relatively new service
- Regulatory concerns
  - Antenna height limitation
  - Power limits
  - Emission masks
- Multiple database administrators (ten)
- Slow international regulatory development
- Few equipment providers
- Middle Class Tax Act of 2012
  - Spectrum re-farming
  - Incentive Auctions



Wrap-Up

- Smart Grid presents new opportunities for White Space.
- Great potential for broadband.
- This is new.
- Success will have applicability to other spectrum.
- Regulatory process has been lengthy, complicated and is still ongoing.
- Is unlicensed spectrum appropriate for critical infrastructure?
- Is there enough spectrum?

Thank You

www.comsearch.com

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H. Mark Gibson
Comsearch
Director, Business Development
703-726-5718 (o)
703-585-6249 (m)
mgibson@comsearch.com